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Memorandum

Date: **October 25, 2005**
To: David Modisette, CalETC
Cc: Dean Taylor, Southern California Edison

From: Ethan Aumann
Loc: Irvine Office

Subject: Draft Final Letter Memo
Re: TIAX Update to 2002 ADL LEV EV Market Assessment

Dave:

Based on the expected and achievable California electric technology populations given in Table 1, TIAX developed projections of the power and energy demand from these technologies for 2010, 2015, 2020. TIAX also provided projections of the ROG, NO_x, and CO_2 emissions displaced and the petroleum displaced by these technologies in 2010, 2015, and 2020. (See tables below).

Note that the emissions and petroleum displacement represents the additional electric equipment brought into use because of incentive programs and upcoming/new regulations. In other words, if a piece of electric equipment was in use due to natural market growth, it was not included in the emissions displacement calculation. In contrast, power and electricity demand were based on the total electric technology population. A detailed description of the calculation methodology follows at the end of the Memo.

Regards,

Ethan

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Table 2. Expected Electric Lawn and Garden Population Detail

Electric Residential Lawn and Garden Equipment	Electric Population (1000s, Unless Stated Otherwise)			
	% of Total	2010	2015	2020
TOTAL	**100%**	**8,000**	**8,500**	**9,000**
Chainsaw Corded	14%	1100	1200	1300
Lawn & Garden Tractors	<.1%	< 10	< 10	< 10
Lawn Mowers	10%	810	860	910
Leaf blowers/ Vacuums	27%	2200	2400	2500
Riding Mowers	<.1%	< 15	< 15	< 15
Shredders	1%	85	90	95
Trimmers/Edgers/Brush Cutters	45%	3700	4000	4200
Wood Splitters	<.1%	< 10	< 10	< 10

Values based on constant electric market share and ARB off-road modeling technical memo, "Change in Population and Activity Factors for Lawn & Garden Equipment", revised June 2003.

Table 3. Expected Cold-Ironing (Alternative Marine Power) Population Detail

Ports: Cold-Ironing (Alternative Marine Power)	Electric Population (1000s, Unless Stated Otherwise)			
	% of Total	2010	2015	2020
TOTAL	**100%**	**17 ships**	**40 ships**	**69 ships**
Cruise Ships	12%	2	5	8
Container Ships	35%	6	14	24
Tanker Ships	18%	3	7	12
Dry Bulk/Break Bulk/Other ships	35%	6	14	24

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Table 4. Technology Drivers/Barriers and Governmental Mandates

Equipment Category	Key Technology Drivers/Barriers	Changes in Legislative/Governmental Mandates and Incentives
Truck stop electrification (TSE)	Barriers: infrastructure costs. Drivers: new technology from IdleAire solves "chicken and egg" problem of infrastructure, as any truck can use this type of TSE. Several other firms are in the market in recent years, including shorepower-types of TSE and battery APUs.	Federal: Bush Admin Energy Plan & 2003 Budget, and Climate Change Plan and USEPA "Climate Leaders" program CA: 2005: Adopt regulation for sleeper cabs to go into effect in 2009. (Truckers get option of diesel ATU or electrification.) 2004: ARB voted to adopt a HD idling emissions reductions requirement WDDERC has selected TSE as one of its main focuses in 2005. TSE is eligible for expanded Moyer incentive program, caps don't apply to TSE--this may cover some or all of the infrastructure costs. CMAQ does fund TSE (how most have been funded to date). EPA announced fine $ would help to fund I-5 corridor TSE. Energy bill pending w/ $90million included for TSE.
Ports: cold-ironing (alternative marine power)	Barriers: More than half the vessels visiting the ports only visit once, is very expensive, and could be a major randomly-occurring power draw, requiring upstream changes to infrastructure/power management. Drivers: 50 year-old technology used by Navy ships. Ten or so new demonstrations in world in last 10 years, including port of LA	Federal: Bush Admin Energy Plan & 2003 Budget, and Climate Change Plan and USEPA "Climate Leaders" program. CA: ARB's Clean Air Plan for next 20 yrs. Is eligible for Moyer $, No net increase, the first commercial berth location & ship installation successful, and the planning of future sites in process
Port cargo handling equipment		CA: EPA's no net increase rule for port emissions
Electrified transportation refrigeration units (e-TRUs)	Drivers: e-TRU's are a clean & cost-effective alternative to diesel. Barriers: Require electrical infrastructure and different equipment, there is a potential for a mandate in this area	CA: 2004: ARB adoption of ATCM for TRU's
Electric lawn and garden equipment	Drivers: Electric options are less expensive; improvements in batteries and cost have made the techs more available. Trade-in programs have helped get techs into the market.	CA: covered in the CA SIP.
Full-size, city, and neighborhood EVs	Drivers: GHG emission standards, ZEV rule, Fleet use Barriers: Battery limitations, and price	Federal: Tax credits, Bush Admin Energy Plan & 2003 Budget, and Climate Change Plan and USEPA "Climate Leaders" program. CA: ARB's Clean Air Plan for next 20 yrs.
Plug-in hybrid EVs	Drivers: existing hybrid technology Barriers: technology not commercialized yet	ARB ZEV program, GHG emission standards
Electric golf carts	lower maintenance cost, lower first cost, quiet, smooth; lower battery life over hilly terrain	100% new purchases in federal ozone non-attainment areas must be electric; those in attainment areas must follow small off-road engine regulations. Currently close to 100% market share. Growth limited to growth in golf cart demand.
Electric sweepers/scrubbers	performance limited by large battery & low run time, solution = fast charge & battery change-out technology; closely linked to battery/fuel cell technology; low maintenance cost, operate over flat terrain	Carl Moyer Program – possible source of funds
Burnishers	Same as above	Same as above
Airport GSE	Drivers: High availability, variety of models, airport demo projects, fast charge technology, ETEC Energy Delivery System (EDS), sealed batteries; low maintenance cost, flat terrain	Carl Moyer Program - source of funds; 1997 Existing Fleet Emissions Rate Goal; 1997 Existing Fleet ZEV Goal; New GSE ZEV Goal; SCAQMD airports must meet 2010 targets for tugs, tractors, and belt loaders of 30% ZEV for existing fleet and 45% ZEV for new fleet; Technology Demo Program

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Table 4. Technology Drivers/Barriers, and Governmental Mandates (continued)

Equipment Category	Key Technology Drivers/Barriers	Changes in Legislative/Governmental Mandates and Incentives
Electric forklifts: Class 1 & 2	Barriers: Sometimes difficult to have centralized charging infrastructure at older sites, requiring additional stations (additional capital cost); Drivers: lower life-cycle cost of operation, esp. with rising fuel costs; trend toward narrow-aisle operations, use-appropriate equipment	ARB LSI / DRR rules may foster adoption of electrics; commitment to permanent Moyer funds
Electric forklifts: Class 3	Drivers: this is a more appropriate size technology for many applications than using oversized Class 4 and 5. Barriers: Class 3 doesn't have an ICE equivalent—would need to increase demand for this type of lift truck.	
Tow tractors	Barrier: Charging infrastructure/equipment capital needed; Driver: widespread use, lower life-cycle cost of operation	ARB LSI / DRR rules may foster adoption of electrics, commitment to permanent Moyer funds
Electric personnel/burden carriers[c]	see above	ARB LSI / DRR rules may foster adoption of electrics, could employ measure requiring electric use, like with golf carts
Turf trucks	see above	see above
Hydrogen fuel cell vehicles	Barriers: Life cycle cost/kg fuel produced much higher than conventional fuel; Drivers: number of demonstration programs increasing	CA governor's Hydrogen Highway program exploring ways to develop hydrogen infrastructure in near-term, CA LDV GHG emission standards to be set in 2005 for MY2009+